



## **Distribution of the near-inertial kinetic energy inside mesoscale eddies: Observations in the Gulf of Mexico**

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The near-inertial oscillations (NIOs), generated by the wind stress on the surface mixed layer, are the inertia gravity waves with the lowest frequency and the highest kinetic energy. NIOs are important because they drive vertical mixing in the interior ocean during wave breaking events. Although the interaction between NIOs and mesoscale eddies has been reported by several authors, these studies are mostly analytical and numerical, and only few observational studies have attempted to show the differences in near-inertial kinetic energy (KEi) between anticyclonic and cyclonic eddies. In this work the spatial structure of the KEi inside the mesoscale eddies is computed using daily satellite altimetry and observations of horizontal velocity from 23 moorings equipped with acoustic Doppler current profilers in the western Gulf of Mexico. Consistent to theory, the obtained four-year KEi-composites show two times more KEi inside the anticyclonic eddies than inside the cyclonic ones. The vertical and horizontal cross-sections of the KEi-composites show that the KEi is mainly located near to the surface of the cyclonic eddies (positive vorticity), whereas the KEi in anticyclonic eddies (negative vorticity) is maximum in the eddy's center near to the base of the eddy where the NIOs become more inertial, are trapped, and amplified. The mean vertical profiles show that the cyclonic eddies present a maximum of KEi near to the surface at  $\sim 50$  m, while the maximum of KEi in the anticyclonic eddies occurs between 900 and 1100 m. Inside anticyclonic eddies another two relative maximums are observed, one in the mixed layer and the second at  $\sim 300$  m. In contrast, the mean profile of KEi outside the mesoscale eddies has the maximum value at the surface ( $\sim 50$  m), with high values of KEi in the first  $\sim 200$  m and negligible energy beneath that depth. A different mean distribution of the KEi is observed depending on the type of wind generator: tropical storms or unidirectional wind.